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ELEMENTARY COURSE

—IN—

MANUAL TRAINING

FOR RURAL SCHOOLS

Price
Thirty-five Cents

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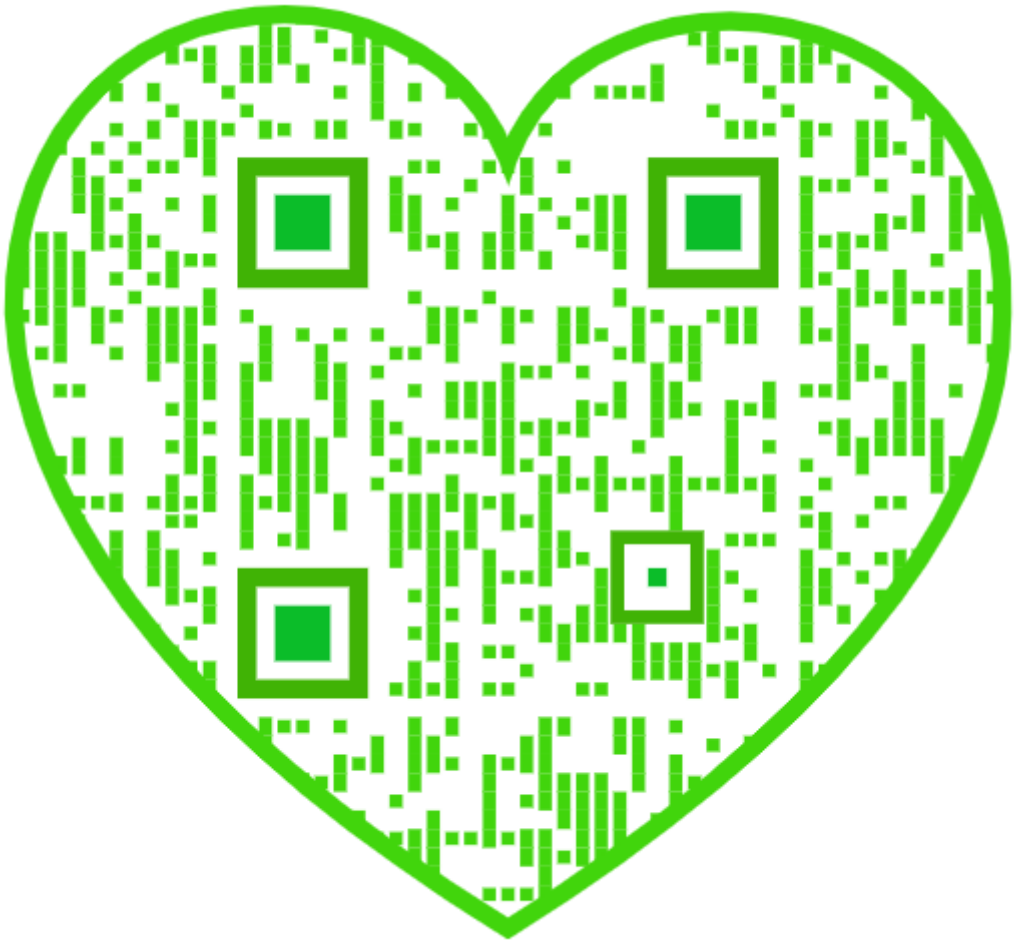
1916



MANUAL TRAINING

FOR RURAL SCHOOLS

——BY——

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PREFACE

The present trend of education is to train the hand as well as the mind.

There is no question but that the study of the three "Rs" is as necessary and vital today as ever. Close observers, however, have found that other studies can be added that will make school work more interesting and practical without detracting from the essentials.

Industrial studies are now firmly established in all progressive high schools and many grade schools, and the movement is spreading to the rural schools as rapidly as conditions permit.

The authors fully realize the difficulties with which the the average rural teacher has to contend in teaching industrial subjects, and particularly manual training. Those who are acquainted with rural conditions know, that the chief difficulties in presenting this subject are: First, lack of training on the part of the teacher; secondly, poor equipment for carrying on such work; thirdly, limited room and time and the lack of a good, workable and easily understood text to direct the work.

16 – 27[illegible]5

The chief fault with the average text in manual training is, that it is too technical, suited only for a well equipped shop with a trained instructor in charge.

The object of this little text is to present suitable work in manual training in such a way, that it can be carried out in any rural school. The necessary equipment (page 6) will fill all the requirements and can be procured with so small an outlay of money that any district can afford it. The problems are simple, and the instruction so clear that one of these texts placed in the hands of the pupil, with a little guidance on the part of the teacher, will practically be all the help he needs.

The authors are indebted to the Manual Arts Press for use of the two drawings showing the use of the plane, and to Gilbert Kaasa for preparing the drawings for the engraver.

If this book will aid the rural teacher in making her effort in manual training more effective and practical, the authors feel that their object has been attained.

—AUTHORS.

TO THE TEACHER

You undoubtedly have a change in your daily program on Friday afternoons. In a great many schools the period after recess is devoted to industrial work of some kind. As a rule, the girls are given sewing which in most cases the teacher finds no difficulty in supervising. Then the question arises what to give the boys to do. Why not try manual training? It will solve the problem.

We believe that this text will help you introduce and carry out systematically a course in this subject throughout the year.

The question of suitable equipment is the first to be met and solved. Many districts readily see the value of this work and gladly furnish the necessary material using the school funds for this purpose. In other cases, teachers raise the money by socials or similar means. The tools listed on the following page are such as are usually found on every farm, and may be loaned by the school as they are required. However, the best way is for the school to own its equipment. Progressive teachers will find some way of providing the means for doing a work that is now recognized as a practical and vital branch of the modern rural school.

The following tools are all that are needed for making the articles given in this book:

Cross Cut Saw (8 point).
Rip Saw (5½ point).
Coping Saw.
Claw Hammer.
Jack Plane (15" long x 2¼" blade).
Block Plane (6" long).
Chisels (⅜" ¾" ¼").
Brace.
Bits (¼" ⅜" ½" ¾").
Flat File (one side curved).
Try Square.
Ruler.
Jack Knife.
Screw Driver.
Oil Stone.
Back Saw.
Spoke Shave.
Marking Gauge.
Compass.

SUPPLIES

Sand Paper, Nos. 00, 0, ½, 1.
Stain and Varnish (small quantity).
Two Good Brushes.
Wax (small quantity).
Screws: 1¼" No. 9; ¾" No. 5.
Brads: ¾", 1", 1¼".
Nails: 6d box.

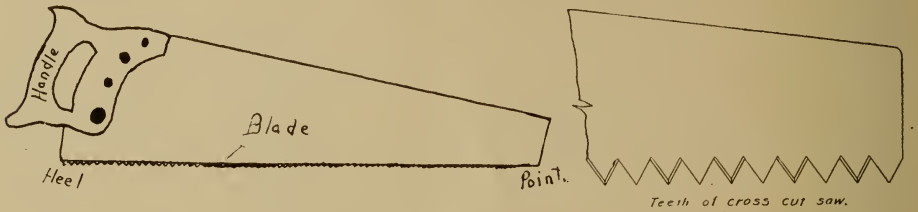
A serviceable work bench may be bought from school supply houses at a small cost, or a carpenter may be hired to make one.

CARE AND USE OF TOOLS

A knowledge of the proper handling and care of the tools is necessary if the pupil is to do good work. Each tool should have its own place, and should be kept there when not in use. Tools should not be permitted to rust, but be kept bright and shiny. Pupils should never be allowed to work with a dull tool. Often a work that has been well started, has been spoiled by the action of a dull plane or chisel. It is suggested that the teacher provide a temporary place for keeping the tools until a permanent rack, cabinet or cupboard can be procured.

CROSSCUT SAW

This tool is used to cut across the grain of the wood. In order to have the blade pass through the cut made, the teeth are bent out or set, the amount of setting depending upon whether the wood is dry or wet. Let the pupil observe the shape of the teeth and compare with those of a rip saw. The number placed on the blade near the handle indicate the number of teeth per inch. An 8 point saw is the one generally used for all ordinary work.

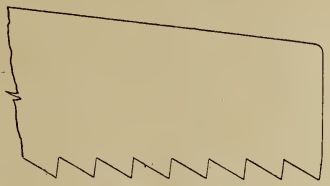


The saw should be held at an angle of 45 degrees with the board, and should be drawn easily and evenly both on the up and down stroke. The first few strokes should be short, then gradually lengthened. Too much pressure should not be put on the down stroke.

Draw a line where a cut is to be made and follow it closely with the saw. When it becomes necessary to have the saw re-set or sharpened, some one can undoubtedly be found in the district who is competent to do this work, and who will be glad to be of service to the school to this extent.

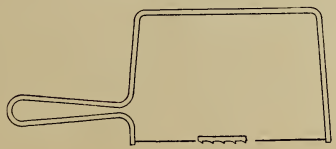
RIP SAW

The rip saw is used for cutting with the grain of the wood. The handling of this tool is the same as that given for the crosscut saw.



Teeth of rip saw.

COPING SAW

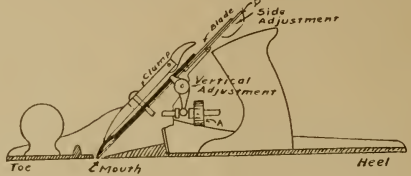


coping saw

Used for cutting out designs and curves.

JACK PLANE

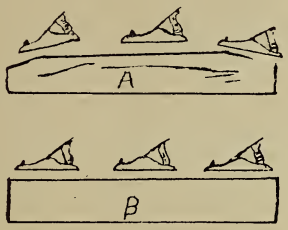
This plane is used for removing large quantities of wood and for smoothening the surface and edges of boards. It contains more parts than any other tool. Study these parts so as to become familiar with their use and correct position.



There are two adjustments of the plane which the user should know. The first adjustment is that of lowering or raising the blade to regulate the thickness of the shaving. This is done by turning the thumb screw (A). The second is that of adjusting the blade so that it will not cut deeper on one side than the other. This is done by moving lever (B) either to the right or left. A little experimenting on the part of the pupil will soon enable him to make the correct adjustments. Care should be taken that the cap iron is placed about one-sixteenth of an inch above the cutting edge of the blade, otherwise the plane will not do smooth and even work. When all adjustments have been made, turn the plane up side down with the toe towards you, hold it towards the light

and sight along the bottom. Turn the thumb screw until the blade is just visible. This adjustment will be found to be the proper one for ordinary work.

When using the plane, press down firmly with one hand on the knob and the other on the handle. The plane should rest flat upon the wood throughout the entire length of the piece, otherwise the result will be a rounding of the board at both ends, as shown in the following figure.



When the plane is not in use, it should be laid on its side so that the edge is not injured in any way.

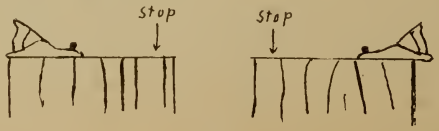
This tool can not be used very long before it becomes necessary to sharpen it. This is done by rubbing it on the oil stone. Two things should be borne in mind when sharpening: First, see that the edge of the blade is square by testing with a try-square.

Second, hold the blade evenly and on the right slant when rubbing on the oil stone as shown in the following figure.

BLOCK PLANE

This tool is used for planing the ends of boards only. It has the same adjustments as the jack plane with the exception that it has no cap iron. The beveled side of the blade is placed up in this plane, while in the jack plane the beveled side is placed down.

Study accompanying figure carefully. Note that the plane is not carried entirely across the end of the board, but should stop an inch or so before reaching the farther edge. This will avoid chipping the farther corner. After a few strokes in one direction reverse the board and proceed as before.

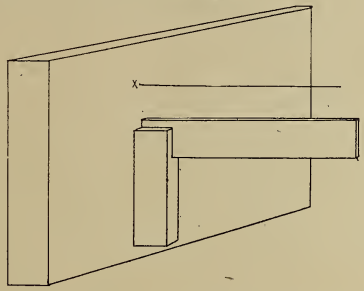


CHISEL

The chisel is used for cutting and paring, and should be kept sharp at all times. The method of sharpening is the same as that of the plane blade. Care should be taken that the proper bevel is kept and that the cutting edge is straight and square with the side.

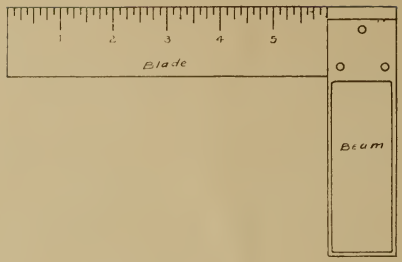
BRACE

The brace is used for holding various sizes of bits. To insure making the hole straight the bit must be held at right angle with the surface. This may be done by using a try square as shown in the following figure.



When making a hole through a piece of wood, the bit should not be forced clear through from the face side, but only until the point is felt on the back side. Reverse the piece and bore from the back side until completed.

TRY-SQUARE



The accuracy of all work in manual training depends upon the correct use of this little tool. Its purposes are two fold: First, it is used for testing a board to ascertain its uniformity as to width or thickness throughout its whole length. Second, it is used to test the end of a board to see that it is square with the edge. Before cutting a piece off a board, the try-square should be used in marking the place where the cut is to be made.

SANDPAPERING

Sandpaper is used to obtain the smooth surface of a finished product. It is numbered to show the degree of coarseness. No. 2 is the coarsest generally used, then follow Nos. 1, ½, 0, 00; the latter being very fine. For beginning the smoothening process, use a paper about No. 1 and finish with No. ½ or 0, on pine wood. Sandpaper is bought in sheets. Each sheet should be cut into four equal parts, and one of these used by placing on a small piece of wood of right size. Never sandpaper across the grain, always with it. When using on a round surface, the sandpaper should be held in the hand. Never use sandpaper on any of your work until all cutting and planing has been done.

VARNISHING AND STAINING

Not all articles need be varnished or stained. A nail box, for instance, might well be left unvarnished, while an article like a plant stand or book rack should be stained. Wood stain can be bought in all colors and easily applied. Care should, however, be taken that both varnish and stain be applied in thin even coats with a soft brush. It is suggested that two small brushes, but of good quality, be obtained for this purpose—one for varnishing and one for staining. Sometimes a wax finish is preferable. Wax may be bought in cans with full directions for use. It makes a cheap, long lasting and popular finish.

BEVELING

Several of the problems in this book require the making of a bevel. This is done by removing a small portion of the surface and edge with the plane. Before using the plane, lines should be drawn both on the surface and edge to indicate the amount to be removed. The size of the bevel will be found on the drawing of each problem where required. Figure I shows the above mentioned lines drawn on the square board; figure II the finished bevel.

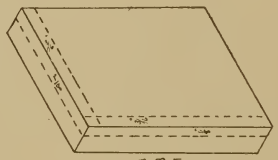


Fig. I

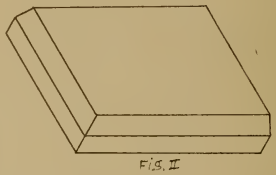


Fig. II

PLANING

As it is not always possible to buy lumber of the exact thickness required for many of the problems, witill be necessary to buy a larger dimension and plane to required size. When doing this, it is well from time to time to test your work by moving the blade of the try-square over the board, holding it and the square toward the light to determine what parts must be removed to make the surface even.

EXPLANATION OF DRAWINGS

In order that the pupil may have a clear conception of each project, a drawing of the finished product and also two or more views looking at the object from different positions are given. The pupil should familiarize himself with the drawings before attempting the work. Where three views are shown, one is the top view, one the front and one the end; wherever two are given, they are the front and end views.

The purpose of the first problem is to teach the pupil the great importance of being accurate in measuring, planing and squaring. In manual training, no matter what the problem may be, the result obtained will depend entirely upon accuracy. This subject should have as one of its aims the forming of the habit of accuracy.

PROBLEM I

PLANING AND SQUARING EXERCISE

For this exercise any odd piece of pine is given the pupil out of which he is to make a finished product measuring exactly $^5/_8$" x 3 $^1/_4$" x 15 $^3/_8$", with all corners and edges absolutely square. In this and all succeeding problems, where the dimensions of the finished product are given, the pupil must make his first cuttings a little larger than those required so as to make allowance for squaring and planing to size.

For instance, in the given problem where the finished product is $^5/_8$" thick by 3 $^1/_4$" wide x 15 $^3/_8$" long, a piece of wood $^3/_4$" by 3½" by 15½" may be taken as the first cutting. From this the pupil shall, by planing, obtain the required size.

The correct method of squaring next requires an explanation.

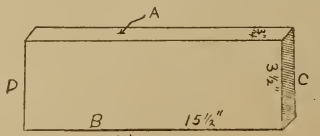


Fig. I

Suppose Figure I represents the board mentioned on page 18. Sight along one edge, as A, to see whether it is straight or where it must be planed to make it so. When edge A is straight, the next step is to get ends C and D square with edge A. This is done by placing the beam of the try square on A with the blade on end C, then D, to determine how much of the board to plane off in order to make both ends square with the side A and at the same time have the required length 15 3/8". All that now remains is to plane side B until the board is 3 1/4" wide and also square with the ends C and D. Before planing the ends read again the paragraph on block plane.

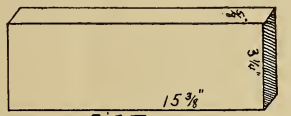
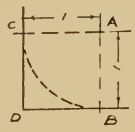


Fig II

If the pupil fails in the first attempt to get the required result he should try it again in order that he may work faster and with more accuracy later.

CUTTING BOARD.



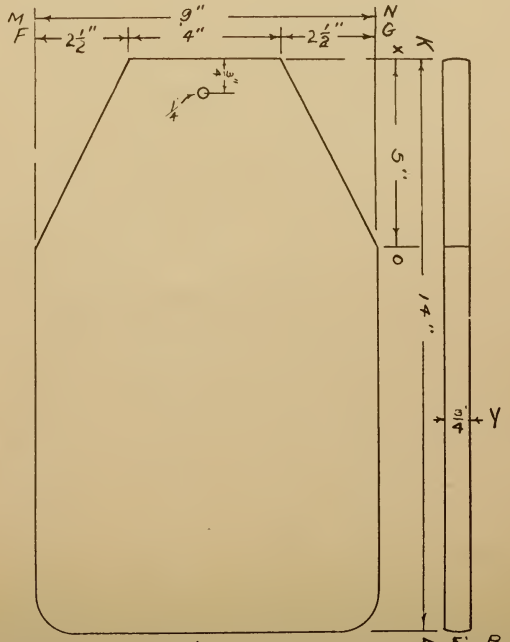


Fig. A

Fig. B

PROBLEM II

MEAT CUTTING BOARD

Material: Maple or Birch.

One piece $\frac{3}{4}$" x 9" x 14".

Note: All measurements are given: Thickness by width by length, and are for the finished product.

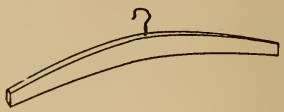
PROCEDURE

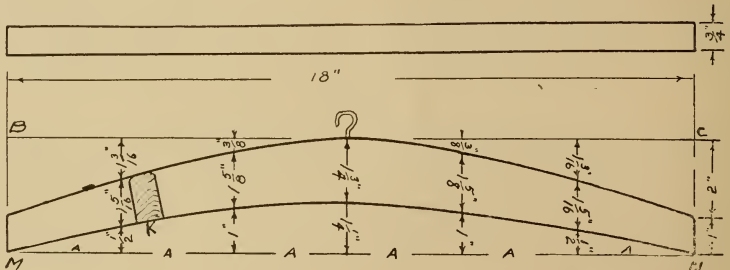
The only new work here is in making the rounded corners. This is done by measuring 1" from D to B (figure on opposite page) and 1" from D to C; with try square draw lines to meet at A. Using a steel compass, place the points at A and B and keeping point A stationary move point from B to C. Remove the portion BDC with a spoke shave and finish with fine sandpaper.

EXPLANATION OF LINES

In Figure B on the opposite page, the line Y ($\frac{3}{4}$") shows the thickness of the cutting board. It will be noticed that the line M N found at the top of Figure A shows only one break and indicates the width of the board to be 9 inches. The line F G shows three breaks, hence three different measurements. The line marked 4" shows the width of the finished top, which is found by cutting off two triangular pieces from the squared board. The lines marked $2\frac{1}{2}$" indicates the distance to be measured in from the edges, and the line X O (5") shows the distance down of the pieces to be cut off to get the top completed. The line K L (14") shows the length of the board. The $\frac{1}{4}$" at the top of the board indicates the size of hole, while $\frac{3}{4}$" shows its distance from the top. Lines indicating dimensions have arrow heads at either end.

COAT HANGER





PROBLEM III

COAT HANGER

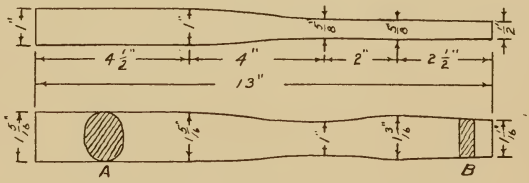
Material: Pine.
One piece 3/4" x 2" x 18".
One screw hook.

PROCEDURE

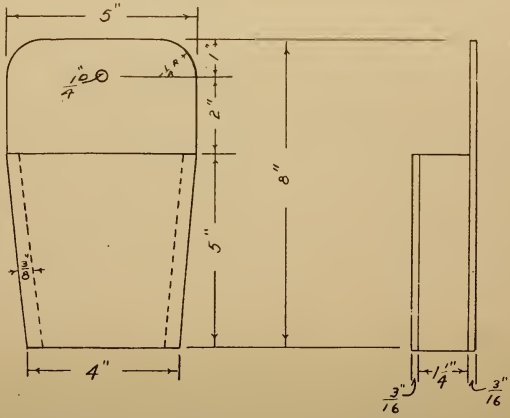
Make a full size drawing of the finished product on the board. To do this and to get the correct curves of the hanger, divide the edges B C and M N into six equal parts as shown on the drawings. (Lines A are each 3 inches). At each of these division points, measure off the distances from both edges as indicated. Lines drawn through these points will form the correct curve for the top and bottom of the finished product. Cut out with a coping saw and finish with file and sandpaper. The appearance of the hanger will be much improved by putting on a small bevel on the upper edge.

The part marked K is the end view of the hanger and shows the grain of the wood.

HAMMER HANDLE



WHISK BROOM HOLDER



PROBLEM IV
HAMMER HANDLE

Material: Maple or Oak.
One piece 1″ x 1 5/16″ x 13″.

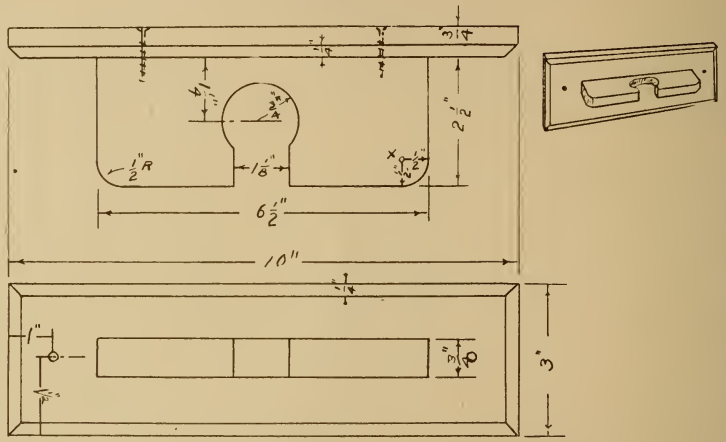
Make a full size drawing of the finished product on the piece from which it is to be made. Remove the necessary portions with a spoke shave and file. The dark portions A and B show the two end views. Sandpaper thoroughly and finish by rubbing with oil.

PROBLEM V
WHISK BROOM HOLDER

Material: Pine.
Back: 1 piece 3/16″ x 5″ x 8″.
Front: 1 piece 3/16″ x 5″ x 5″.
Sides: 2 pieces 3/8″ x 1 1/4″ x 5″.
1″ brads.

There is no new step involved in making this problem. It is quite likely that the material secured for making this is much thicker than the finished product is to be, hence a great deal of planing is required. The pupil should read again the paragraph on page 16 for the correct method of planing. Sandpaper and finish with stain and varnish or wax.

BROOM HOLDER.



PROBLEM VI

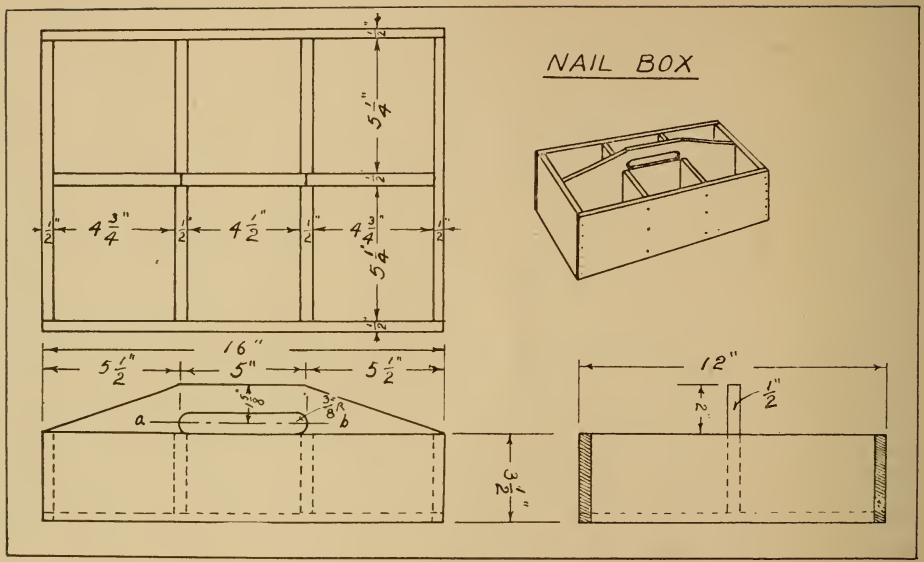
BROOM HOLDER

Material: Pine.
Back: 1 piece 3/4" x 3" x 10".
Holder: 1 piece 3/4" x 2 1/2" x 6½".
Two 1 1/4" screws.

PROCEDURE

Back: The bevel is made by measuring 1/4" both on the surface and edge and removing with plane.

Holder: The 1/2" R shown on the left corner, indicates a curve with a radius of 1/2". This is obtained by measuring 1/2" in from both sides to get the point X (shown on right hand corner). Draw the curve with a compass, and remove corner with a spoke shave. An extension bit is the best tool for boring the hole (radius 3/4"). If, however, this tool is not included in your equipment and can not be borrowed, the hole may be made by boring many smaller holes around the circle and smoothen with a file. May be finished with stain and varnish or wax.


NAIL BOX
1/2"
4 3/4"
4 1/2"
5 1/4"
16"
5 1/2"
5"
1/16"
3/8"
a
b
3 1/2"
12"
2"
1 1/2"

PROBLEM VII

NAIL BOX

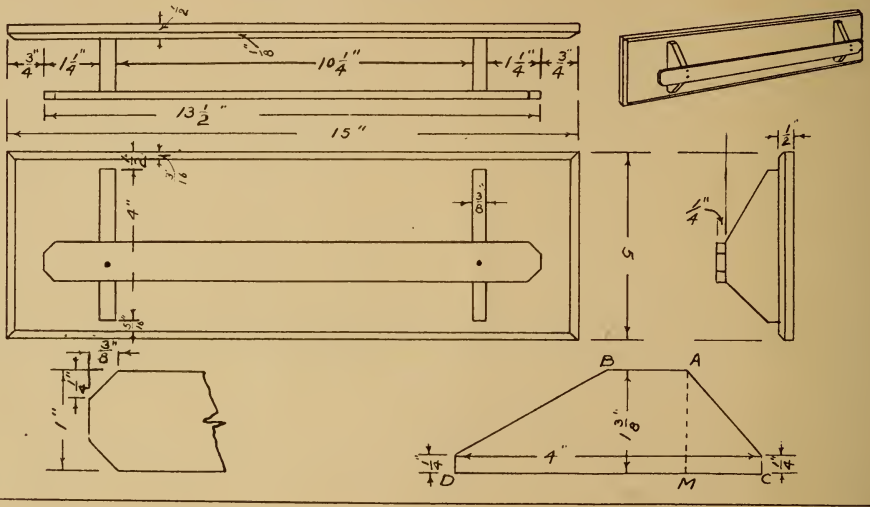
Material: Pine.
Bottom: 2 pieces 1/2" x 5 1/2" x 15".
Sides: 2 pieces 1/2" x 3 1/2" x 16".
Ends: 2 pieces 1/2" x 3 1/2" x 11".
Middle Partition: 1 piece 1/2" x 5" x 15".
Partitions: 4 pieces 1/2" x 3" x 5¼".

PROCEDURE

All material used in making this article should be 1/2" thick. This is obtained by using either 1/2" lumber or by planing ¾" material down to size. The making of this article involves only such work as was done in Problem I. In making the opening in the middle partition, draw the line A B 5/8" down from the top and to points 5 1/2" from either end. Placing the point of the ¾" bit on this line, bore the entire length of the opening (5"), and finish with a file.

The two bottom pieces should be made first. Next get the sides ready and finally the partitions. When all pieces are square and all similar pieces of the same size, sandpaper carefully. In putting the box together, remember that the bottom is placed inside the sides and ends. Fasten together by using 1½" inch brads.

NECKTIE RACK.



PROBLEM VIII

NECKTIE RACK

Material: Pine.
Back: 1 piece 1/2" x 5" x 15".
Brackets: 2 pieces 3/8" x 1 3/8" x 4".
Cross Rod: 1 piece 1/4" x 1" x 13 1/2".
Two screw eyes for hanging rack.
Two brass screws 5/8" long.

PROCEDURE

First make the back. This involves the work given in Problem I with the additional work of making a bevel. (Read the paragraph on beveling on page 16.)

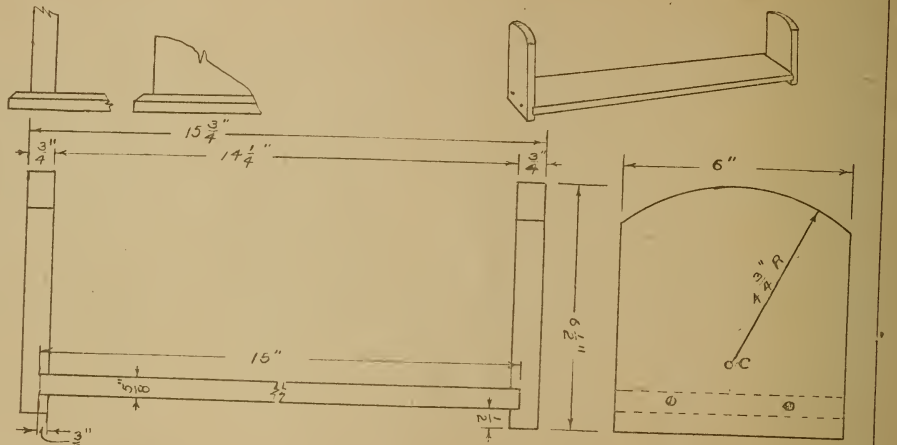
BRACKETS

Take the two pieces from which the brackets are to be made and get them exactly the same size, 4" by 1 3/8". Next study carefully the drawing of the bracket on the opposite page. The part A B is 1" wide. Point A is found by measuring 1" on line C D. At this point M draw a line across the board. using the try square and mark point A. Measure 1" from A to B then with the back saw cut along lines B D and A C, 1/4" from C D. The front strip is made as shown in the diagram.

The brackets are fastened to the back by driving three brads into each bracket from the back. Notice how far in the brackets are placed and use the try square to see that they are square with top and bottom edges. The cross piece is fastened to the brackets by using one brass screw.

The rack should be sandpapered with fine sandpaper before being put together, and should then be stained some suitable color, and either waxed or varnished.

BOOK RACK



PROBLEM IX

BOOK RACK

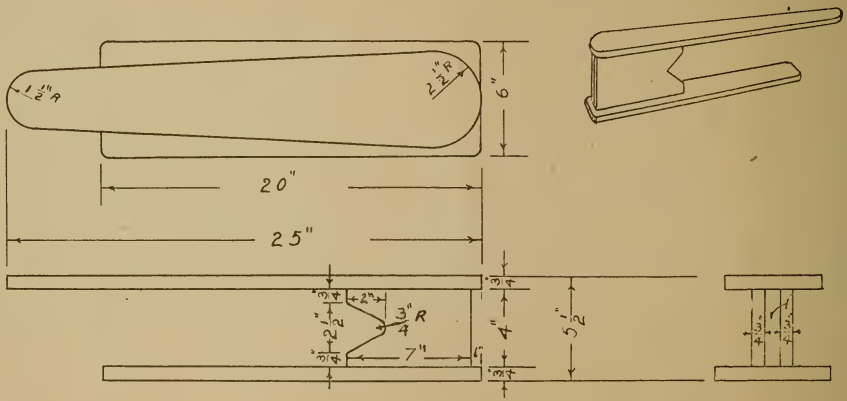
Material: Pine or Oak.
Base: 1 piece $\frac{5}{8}$" x 6 $\frac{1}{2}$" x 15".
Ends: 2 pieces $\frac{3}{4}$" x 6" x 6 $\frac{1}{2}$".
Four 1" brass screws.

PROCEDURE

The only new feature in this problem is fitting the base into the ends. Mark off two lines on each end piece to indicate the cut where the grooves are to be made, the lower line $\frac{1}{2}$" from the bottom. The lines are to be as far apart as the thickness of the base board. To insure a straight cutting, it is advisable to place a straight board even with the pencil mark and letting the back saw rest up against it. This prevents any wabbling of the saw. Remove the part between the cuts with a chisel, taking care to make the depth uniform ($\frac{3}{8}$"). The end pieces will be more firm if they are fastened to the base with two brass screws. The point C is found by measuring $1\frac{3}{4}$" up from the bottom. Finish with sandpaper and stain with some dark color and varnish or wax.

The two small drawings found at the upper left hand corner show another method of fastening the end pieces to the base, which may be used if so desired.

SLEEVE BOARD.



PROBLEM X.

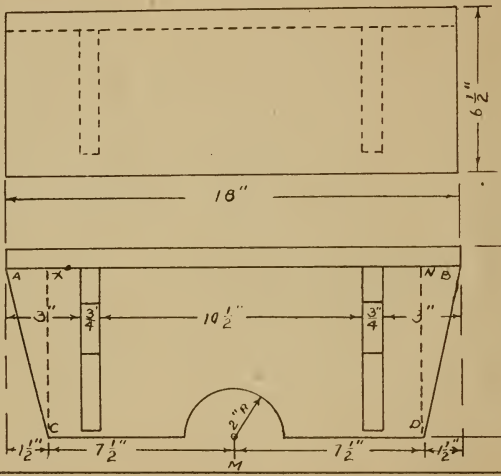
SLEEVE BOARD

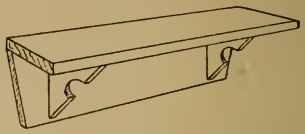
Material: Pine.
Top: 1 piece 3/4" x 5" x 25".
Bottom: 1 piece 3/4" x 6" x 20".
Blocks: 2 pieces 3/4" x 4" x 7".
Screws: 1 1/4".

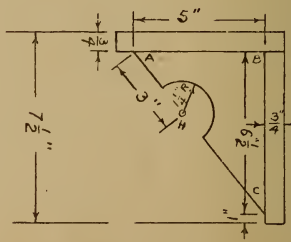
PROCEDURE

Draw a full size design of the top piece on the board from which it is to be cut and plane to size. Blocks: Care must be taken that the two blocks are made so as to be exactly alike. In making the curves, first bore a 3/4" hole at the place indicated on the drawing. Remove the remaining part with a back saw. Sandpaper and finish all parts, except the top, with shellac.

WALL SHELF







PROBLEM XI

WALL SHELF

Material: Pine.
Top: 1 piece $\frac{3}{4}$" x 6 $\frac{1}{2}$" x 18".
Back: 1 piece $\frac{3}{4}$" x 7 $\frac{1}{2}$" x 18".
Bracket: 1 piece $\frac{3}{4}$" x 5" x 6 $\frac{1}{2}$".
Eight 1 $\frac{1}{4}$" screws.

PROCEDURE

The top piece is a problem of squaring only.

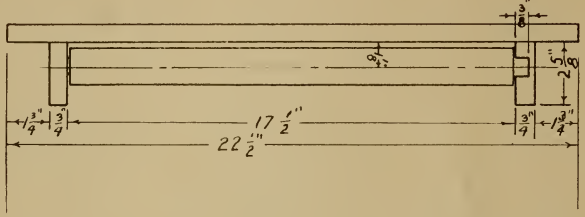
Back: From the points A and B measure 1$\frac{1}{2}$" along line A B. Placing the try square at the points X and N, draw lines across the board to obtain the points C and D, then saw just outside the lines A C and B D. Measuring 7$\frac{1}{2}$" from point C, mark a point as M. Here draw a half circle with a radius of 2 inches. Cut just outside this line with the coping saw and smoothen with sandpaper.

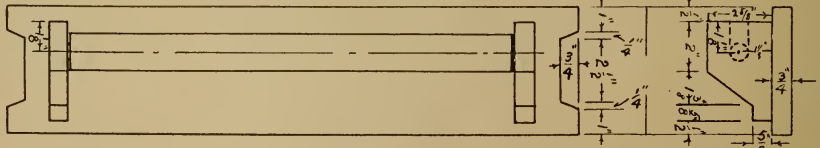
Brackets: Take the piece 6 $\frac{1}{2}$" x 5" and draw a line diagonally across it. Cut along this line with the back saw. Having squared the sides A B and B C, measure off 3" from point A along A C to get point H. Draw a half circle with a radius of 1$\frac{1}{4}$ inches. Remove with coping saw. When all parts are finished, sandpaper until smooth.

ASSEMBLING

First fasten the brackets to back 3" from the upper corner using two 1$\frac{1}{4}$" screws put in from the back, then the top to the bracket using two 1 $\frac{1}{4}$" screws in each bracket sinking them level with the top. When all parts are put together correctly, stain and finish either with varnish or wax.

TOWEL ROLLER





PROBLEM XII.

TOWEL ROLLER

Material: Pine.
Back: 1 piece 3/4" x 5 5/8" x 22 1/2".
Brackets: 2 pieces 3/4" x 2 5/8" x 4".
Roller: 1 piece 1 1/2" diam. x 18 1/4".

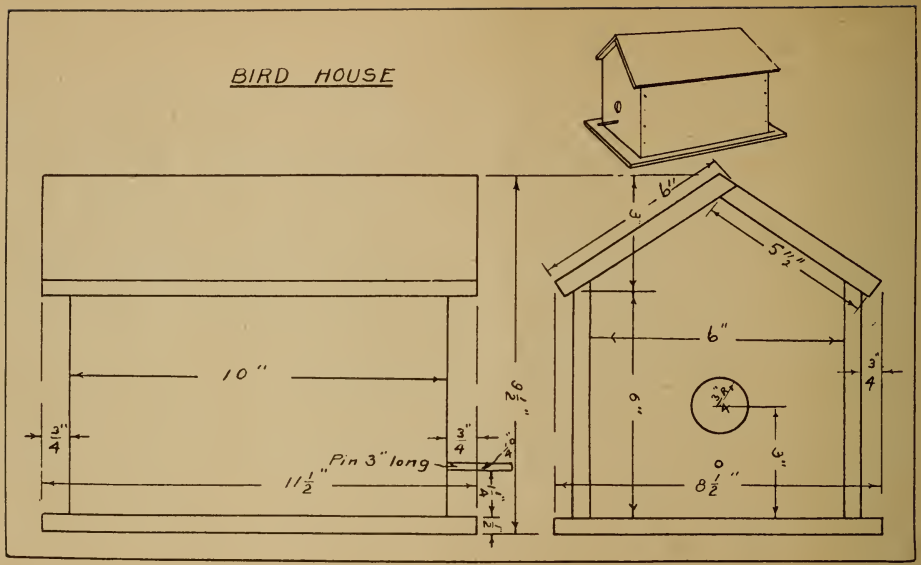
PROCEDURE

Use a 3/4" bit to remove the part at either end of the back piece.

The pupil should meet with no difficulty in making the brackets, as all lines are straight and all necessary measurements are shown. In making the hole for the roller pin, place a 3/4" bit at a point 1 1/8" inch down and 1 1/8" from the back; and bore to a depth of 3/8". On the left bracket, a slit 3/8" deep is made for putting the roller in place. Draw lines to indicate the width of the slit and remove with a chisel to a uniform depth of 3/8". Brackets are fastened to the back piece by using two 1 1/4" screws.

Roller: The making of this piece requires some careful work. It is made from a piece 1 1/2" square and 18 1/4" long. Begin the rounding process by planing down each edge so as to make a uniform eight sided figure. Continue planing the edges until the piece is as nearly round as can be made with a plane. Finish rounding by using coarse sandpaper. The pins at either end of the roller are 3/4" diameter. These are made by measuring in 3/8" and sawing down evenly to a depth of 3/8". Remove with chisel or knife and round with sandpaper.

Stain the back piece and brackets some dark color and wax or varnish. The roller should not be stained but only varnished or waxed.


BIRD HOUSE
10"
3/4"
3/4"
11 1/2"
Pin 3" long
9 1/2"
6"
5 1/2"
6"
6"
3/4"
3"
8 1/2"

PROBLEM XIII.

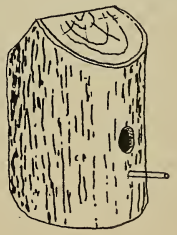
BIRD HOUSE

Material: Pine.
Bottom: 1 piece 1/2" x 8 1/2" x 11½".
Sides: 2 pieces 1/2" x 6" x 10".
Ends: 2 pieces 1/2" x 6" x 9".
Top: 1 piece 1/2" x 6" x 11".
1 piece 1/2" x 5½" x 11".
Brads: 1½".

PROCEDURE

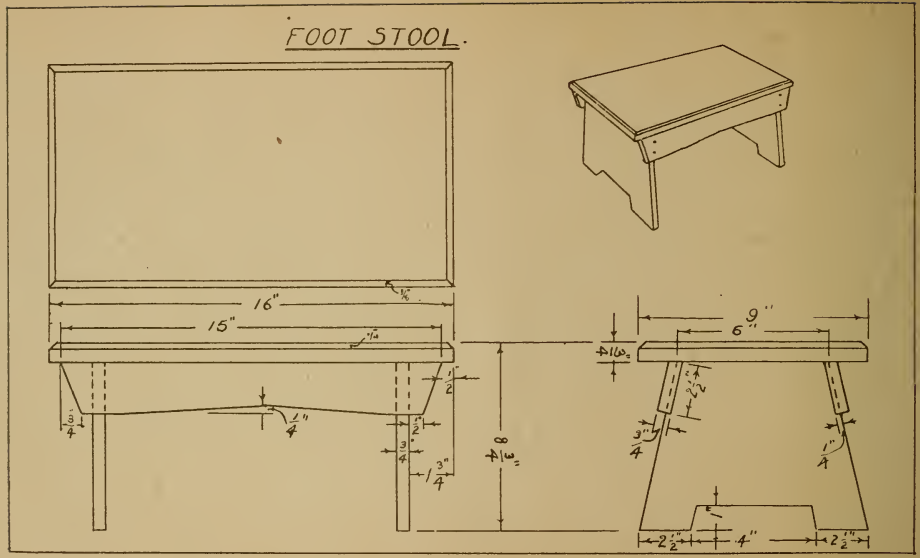
There is practically nothing new in the making of this problem. The pupil must be careful to have each opposite piece exactly the same size and absolutely square. Use care in fitting the top pieces, as it will be noticed that they over-lap each other. The top edge of the side pieces must be planed to a correct slant so that the top will rest on them evenly. In assembling the parts the sides come outside the ends.

It is suggested that the top be painted green and the remaining parts white. Never use any conspicuous colors.



There are numerous rustic designs that are very attractive and easily made. Note the design given here.

FOOT STOOL.



PROBLEM XIV.

FOOT STOOL

Material: Pine or Oak.
Top: 1 piece 3/4" x 9" x 16".
Ends: 2 pieces 3/4" x 9" x 8".
Sides: 2 pieces 3/4" x 2 1/2" x 15".
Two pieces 3/4" x 3/4" x 5".
Screws 1 1/4".

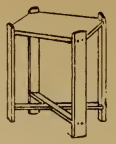
PROCEDURE

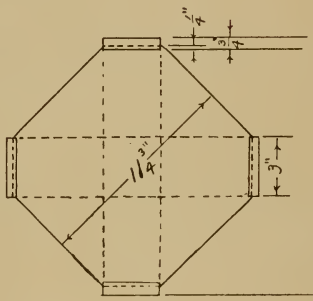
The top may be beveled to the measurements shown, if so desired.

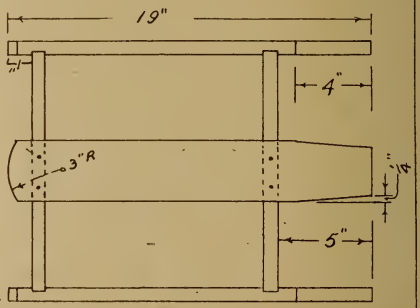
Draw lines to indicate the parts to be removed at the bottom of the end pieces. Using 1/4" bit, bore holes just inside the line, saw to depth and finish with file. Note that the side pieces are fitted into the end pieces to the depth of 1/4". At the middle point of each side piece, measure up 1/4". Draw lines from this point to within 2½" from lower corner, and remove the required part. Fasten the side pieces to the ends by using two round headed screws.

The two pieces, 3/4" x 3/4" x 5", mentioned in the bill of material, are to be used for fastening top. Placing these pieces on the inner side even with the top edge of the end pieces, fasten securely by using two 1¼" screws. The top is then fastened by putting two 1¼" screws through the small pieces into the top. Stain some dark color and varnish.

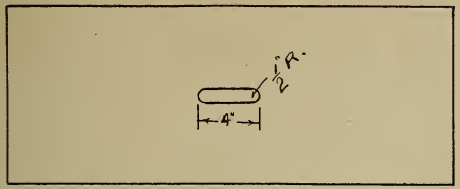
TABORET

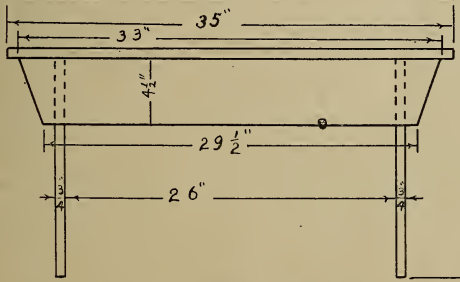


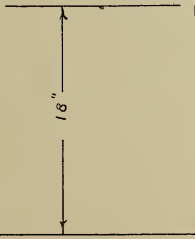


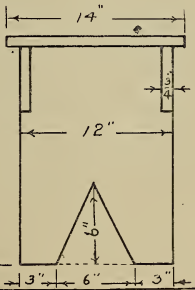


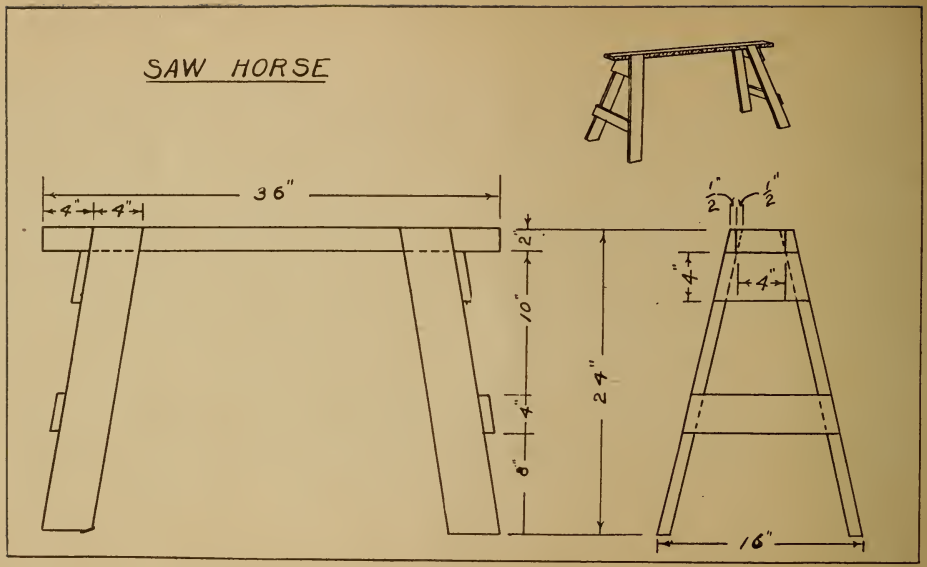
WASH BENCH



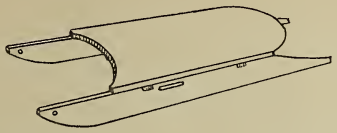


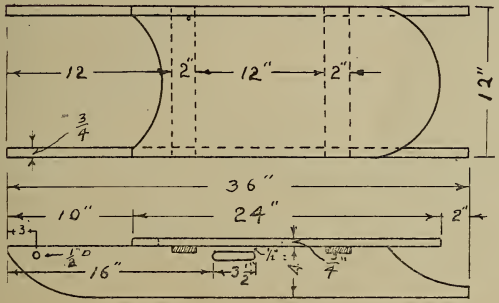


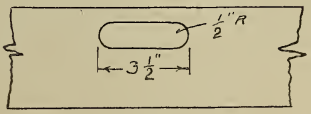


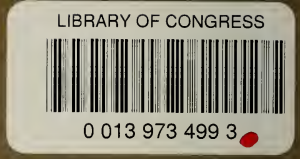

SAW HORSE
36"
4"
4"
2"
10"
4"
8"
24"
1"
2
1"
2
4"
4"
16"

SLED





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